REUSE OF OLD *TRYPOXYLON POLITUM* NEST BY *CHALYBION CALIFORNICUM* (HYMENOPTERA: SPHECIDAE) IN NEW YORK, U.S.A.[1]

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ABSTRACT: The re-use of an old *Trypoxylon politum* mud pipe organ nest by a female *Chalybion californicum* is described and illustrated. The female *C. californicum* cleaned, renovated, and stocked with paralyzed spiders 19 of the abandoned 25 *T. politum* cells. Some *C. californicum* behavioral components are delineated.

KEY WORDS: Re-use of nests, *Trypoxylon, Chalybion,* Hymenoptera, Sphecidae.

Species of *Chalybion* build mud nests in preexisting cavities and crevices and renovate the abandoned mud nests of other species of wasps (Bohart and Menke 1976). Females carry water to a nearby earthen source and mold mud to partition and seal these nests (Rau 1928, Ward 1971). Species of *Chalybion* renovate and stock with paralyzed spiders the abandoned mud nests of *Sceliphron* and *Trypoxylon* (Bohart and Menke 1976). Old nests of the yellow and black mud dauber, *Sceliphron caementarium* (Drury), are sometimes reused for nesting by the blue mud dauber, *Chalybion californicum* (Saussure) (Rau 1928). The re-use of an abandoned mud pipe organ nest of *Trypoxylon politum* Say by a female *C. californicum* is unusual, has not been previously documented, and is detailed below.

RESULTS

An old *T. politum* nest located on the outskirts of Syracuse (Onondaga County, New York, U.S.A.) had seven pipes affixed near the top of a vertical cedar siding board underneath a 70 cm-wide roof overhang (Fig. 1). The seven pipes were built consecutively from left to right by one female in July 1999. The three shortest pipes on the right side of the nest were the last three built by the aging wasp. The individual pipes were 11-13 mm wide and 89-124 mm long. Twenty-five exit holes of wasps that emerged the following year [2000] were spaced 16-20 mm apart along the seven pipes. The number of holes per pipe [3-4] varied with pipe length. Thirteen of the holes were 6 mm in diameter and probably resulted from female emergence. Twelve of the holes were either 4 or 5 mm wide and may have been made by emerging males, assuming they were smaller than the females.

The female *C. californicum* was first observed on the old *T. politum* nest on July 12, 2002. Through July 26 she renovated, provisioned, and closed 13 cells

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Figure 1. Old nest of *Trypoxylon politum* about midway through nesting sequence of *Chalybion californicum*. Female *C. californicum* is resting head downward near top of second pipe from left. Three pipes to right have been provisioned and sealed with mud.

during mainly sunny, unusually warm [air temperature in shade, 24.4-36.7°C] dry weather. Her earliest and latest hours working at the nest were 0946 and 1945 (EDT), respectively. She was seen bringing prey to the nest as early as 1006 h (EDT) at an air temperature [shade] of 26.7°C. She did not work at the nest on one rainy day or on a cool [16.7-22.8°C] but dry day. She worked intermittently at the nest from July 26 to August 5 between sporadic periods of rainfall renovating, stocking with prey, and closing with mud six additional cells/emergence holes.

Her daily routine consisted of (1) searching for and finding an unoccupied *T. politum* emergence hole/cell, (2) working in the emergence hole and cell removing old cell contents, (3) walking around the emergence hole and on the nest surface before taking flight, (4) returning in flight with a small paralyzed spider, (5) placing the spider in the cell, repositioning it with the mandibles and, later, tightly packing in other spiders using the front of the head, (6) ovipositing on one spider outside the cell and then placing it inside, (7) cleaning the antennae and mandibles with the forelegs before taking flight, and (8) bringing mud pellets from the other side of the nest, after depositing water on the old mud, and plastering the hole shut.

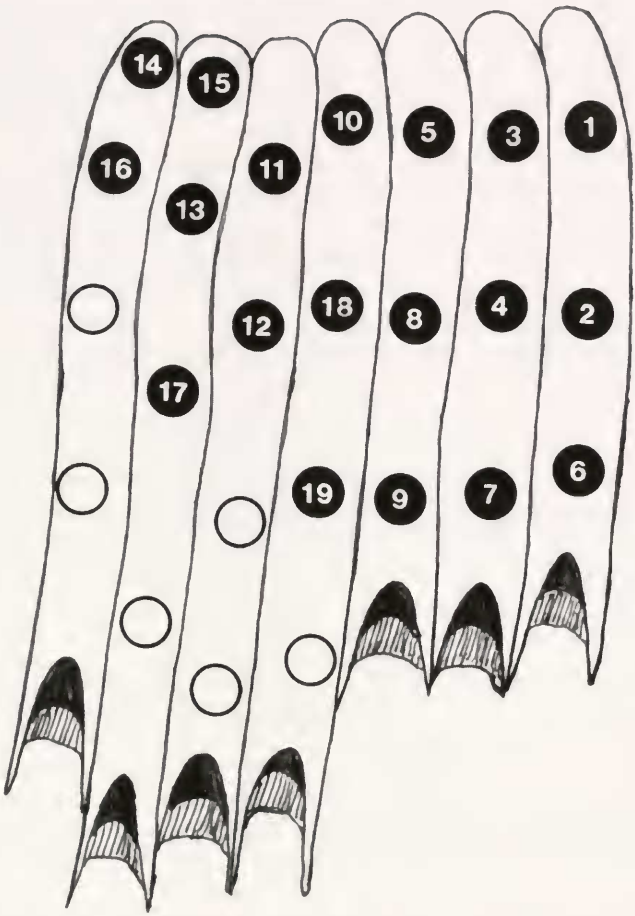

Figure 2. Diagram of old nest of *Trypoxylon politum* showing chronological order in which 19 of 25 cells were provisioned (stocked with prey) and closed by female *C. californicum*. Open circles designate cells that were not provisioned.

The female *C. californicum* spent 58-132 minutes [mean = 84.3 ± 32.97 standard deviations of the mean, n = 8] searching for and renovating an unoccupied *T. politum* cell prior to introducing prey. The wasp utilized 2-24 [mean = 13.6 ± 7.62, n = 12], 3-23 [mean = 12.3 ± 7.11, n = 8], 4-36 [mean = 17.4 ± 9.84, n = 11], 3-35 [mean = 10.6 ± 9.60, n = 12] and 3-47 minutes [mean = 20.8 ± 12.26, n = 12] between consecutive returns with prey for cells 15-19, respectively. She used 3-41 minutes [mean = 21.4 ± 11.23, n=14] between returns to the nest without prey. She spent from 10 seconds to 1-2 minutes walking around the emer-

gence hole and on the nest exterior after placing a spider in the cell and before taking flight. She expended 36-68 minutes [mean = 55.0 ± 14.41, n = 9] to plaster shut an old *T. politum* emergence hole. She used 11-41 minutes [mean = 21.9 ± 13.33, n = 5] to temporarily plug an emergence hole in order to finish the cell the next morning.

The wasp stocked with spiders and plastered over the three pipes to the right beginning always with the uppermost holes/cells, as numbered in order of completion (Fig. 2), before moving to the other pipes. She then worked on the upper holes/cells of the remaining four pipes moving mainly from right to left. The cells that were renovated, provisioned, and closed first were usually most protected by the roof overhang.

Re-stinging a spider was observed several times on the nest exterior. Once, re-stinging preceded oviposition. Oviposition was seen five times on the nest exterior beside an old emergence hole. Prior to ovipositing on the spider, the wasp bent her abdomen in the shape of a letter C and rocked it slowly forward and backward. Keeping the abdomen bent, she placed the tip against the convex surface of the base of the spider's abdomen and affixed a whitish, sausage-shaped egg. She deposited eggs on the 2nd, 3rd, 4th, 5th, and 6th prey brought for cells that, when completed, contained 12, 12, 8, 12, and 11 spiders, respectively.

Six fully provisioned cells (nos. 14-19) held 8-12 (mean = 11.0 ± 1.73) spiders. Most of the spiders brought to the nest were about the size of the wasp's thorax, some smaller, and a few larger. Once, the female flew in with a relatively large immature *Neoscona arabesca* (Walckenaer) weighing 38 mg. This prey was too large to fit into the opening, was carried away by the wasp, and released on the ground. One small *Theridion frondeum* Hentz was accidentally dropped outside as the wasp was attempting to place it in a cell. The spider discharged silk from its spinnerets as it fell downward. The female flew rapidly downward, caught the spider in midair, flew back to the opening, landed, and placed it in the cell.

A sample of prey spiders recovered from four cells consisted of male and female Theridiidae [*Steatoda borealis* (Hentz), 8; *Theridion tepidariorum* (C. L. Koch), 8; *T. frondeum,* 23] and immature Araneidae [*Neoscona arabesca,* 3; *Araneus diadematus* Clerck, 1].

DISCUSSION

Prior studies link *C. californicum* with reusing old nests of the yellow and black mud dauber, *Sceliphron caementarium* (Rau 1928). *Chalybion californicum* has not been noted reusing old mud nests of the pipe organ wasp, *Trypoxylon politum.* However, other *Chalybion* species are known to reuse abandoned nests of other *Trypoxylon* species (Bohart and Menke 1976).

There is disagreement as to where and when the egg of *C. californicum* is laid (Bohart and Menke 1976). Yamamoto (1942) observed that the egg of *C. japonicum* (Gribodo) was affixed to the spider's abdomen before the prey was placed

in the cell, as I noted for *C. californicum*. Rau (1928) may have unknowingly witnessed oviposition on a prey of *C. californicum* outside the cell, but he reported the behavior as stinging. He described a wasp curling its abdomen underneath that of the first spider brought to the nest and inserting the sting for 15 seconds. All of the stings I observed administered to *C. californicum* prey were in the underside of the prey's cephalothorax, not in the abdomen.

Rau (1928), as reported by Bohart and Menke (1976), believed that the egg of *C. californicum* is laid on the last spider brought to the cell. Muma and Jeffers (1945) noted that the egg of this species is placed on the first prey for the cell, but they indicated that this might not always be the case. I found that the egg of *C. californicum* was laid on a spider early in the provisioning sequence, usually before half the spiders were introduced to the cell. Yamamoto (1958) found similarly in *C. japonicum* that the egg was usually laid on a spider before half the prey had been placed in the cell.

In previous studies on *C. californicum* the predominant prey family was Theridiidae (Rau 1935; Irving and Hinman 1945; Muma and Jeffers 1945), as I found in my study. Common use of the black widow spider, *Latrodectus mactans* (Fabricius), a theridiid, was noted in these reports.

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